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EXAMINER	
KURR, JASON RICHARD	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/522,515	DAVIS, MARK FRANKLIN	
	Examiner	Art Unit	
	JASON R. KURR	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _27 January 2005_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-32_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-3,6-23 and 25-32_ is/are rejected.

7)☒ Claim(s) _4,5 and 24_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _27 January 2005_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _5/27/05_.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 9-10, 18-20, 28 and 32 are objected to because of the following informalities: Claims 9-10, 18-20, 28 and 32 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim may not be dependent upon another multiple dependent claim. See MPEP § 608.01(n). Accordingly, the claims have not been further treated on the merits.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Irwan et al (US 6,496,584 B2).

With respect to claim 1, Irwan discloses a process for translating M audio input signals (fig.2 “L,R”), each associated with a direction, to N audio output signals (fig.2 “L,R,C,S”), each associated with a direction, wherein N is larger than M, M is two or

more and N is a positive integer equal to three or more, comprising providing an M:N variable matrix (fig.2 #5), applying said M audio input signals to said variable matrix, deriving said N audio output signals from said variable matrix (col.3 ln.48-64), and controlling said variable matrix in response to said input signals (col.3 ln.34-48) so that a sound field generated by said output signals has a compact sound image in the nominal ongoing primary direction of the input signals when the input signals are highly correlated, the image spreading from compact to broad as the correlation decreases and progressively splitting into multiple compact sound images, each in a direction associated with an input signal, as the correlation continues to decrease to highly uncorrelated (fig.1, col.2 ln.61-67, col.3 ln.1-28). It is clear from figure 1 of Irwan that the correlation ratio (a/b) is directly affected by the momentaneous amplitude of the input L and R signals. Such signal amplitude fluctuations provide a variability in the location of a sound image, thus the correlation between the “L” and “R” signals is directly related to the direction or localization of the sound image, whether it be compact or broadened.

With respect to claim 2, Irwan discloses a process according to claim 1 wherein said M:N variable matrix is a variable matrix having variable coefficients or is a variable matrix having fixed coefficients and variable outputs, and said variable matrix is controlled by varying the variable coefficients or by varying the variable outputs (col.3 ln.39-55).

With respect to claim 3, Irwan discloses a process according to claim 1 wherein said variable matrix is controlled in response to measures of: (1) the relative levels of the input signals, and (2) the cross-correlation of the input signals (col.3 ln.17-28).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6-8, 11-17 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Irwan et al (US 6,496,584 B2) in view of Abel (US 5,659,619).

With respect to claim 6, Irwan discloses a process according to claim 3 however does not disclose expressly the details of the stereo magnitude measuring means (fig.2 #2), wherein a measure of the relative levels of the input signals is in response to a smoothed energy level of each input signal.

Abel discloses a method of generating a spatialized output signal in a stereophonic audio system wherein a measure of relative levels of an input signal (fig.6a #50) is subject to a smoothing function (fig.6a #54) prior applying as a transfer function (col.6 ln.18-62). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the smoothing function of Abel in the magnitude

measuring (fig.2 #2) of the variable a/b in the invention of Irwan. The motivation for doing so would have been to provide a way to reduce the complexity of calculating coefficients of a stereophonic audio matrix while maintaining the perceptual impact and psychoacoustic localization characteristics of the original directional cues of the input signal as taught by Abel (col.3 ln.26-29).

With respect to claim 7, Irwan discloses a process according to claim 3 or claim 6 wherein a measure of the relative levels of the input signals is a nominal ongoing primary direction of the input signals (Irwan: col.3 ln.39-48).

With respect to claim 8, Irwan discloses a process according to claim 3, however does not disclose expressly wherein a measure of the cross-correlation of the input signals is in response to a smoothed common energy of the input signals divided by the Mth root of the product of the smoothed energy level of each input signal, where M is the number of inputs. Abel discloses smoothing common energy of input signals divided by the Mth root of the product of the smoothed energy level of each input signal, where M is the number of inputs (col.6 ln.43-62). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the smoothing function of Abel in the invention of Irwan. The motivation for doing so would have been the same as discussed in claim 6 above.

With respect to claim 11, Irwan discloses a process according to claim 8 wherein the common energy of the input signals is obtained by cross-multiplying the input amplitude levels (Abel: col.6 ln.49-62).

With respect to claim 12, Irwan discloses a process according to claim 11 wherein the smoothed common energy of the input signals is obtained by variable-time-constant time-domain smoothing the common energy of the input signals (Abel: col.6 ln.18-25).

With respect to claim 13, Irwan discloses a process according to claim 12 wherein the smoothed energy level of each input signal is obtained by variable-time-constant time-domain smoothing (Abel: col.6 ln.18-25).

With respect to claim 14, Irwan discloses a process according to claim 11 wherein the smoothed common energy of the input signals is obtained by frequency-domain smoothing and variable-time-constant time-domain smoothing the common energy of the input signals (Abel: col.6 ln.18-25).

With respect to claim 15, Irwan discloses a process according to claim 14 wherein the smoothed energy level of each input signal is obtained by frequency-domain smoothing and variable-time-constant time-domain smoothing (Abel: col.6 ln.18-25).

With respect to claim 16, Irwan discloses a process according to any one of claims 9, 10, 12, 13, 14 and 15, wherein said variable-time-constant time-domain smoothing is performed by smoothing having both a fixed time constant and a variable time constant (Abel: col.6 ln.18-25).

With respect to claim 17, Irwan discloses a process according to any one of claims 9, 10, 12, 13, 14 and 15, wherein said variable-time-constant time-domain

smoothing is performed by smoothing having only a variable time constant (Abel: col.6 ln.18-25).

With respect to claim 21, Irwan discloses a process according to claim 6 wherein the smoothed energy level of each input signal is obtained by variable-time-constant time-domain smoothing the energy levels of each input signal with substantially the same time constant (Abel: col.6 ln.18-25).

With respect to claim 22, Irwan discloses a process according to claim 3 wherein the measures of the relative levels of the input signals and their cross-correlation are each obtained by variable-time-constant time-domain smoothing in which the same time constant is applied to each smoothing (Abel: col.6 ln.18-25).

With respect to claim 23, Irwan discloses a process according to claim 8 wherein said measure of cross-correlation is a first measure of cross-correlation of the input signals and an additional measure of cross-correlation is obtained by applying a measure of the relative levels of the input signals to said first measure of cross-correlation to produce a direction-weighted measure of cross-correlation (Irwan: col.3 ln.39-45).

Claims 25-27, 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Irwan et al (US 6,496,584 B2) in view of Moorer (US 6,072,878).

With respect to claim 25, Irwan discloses a process for translating M audio input signals (fig.2 “L,R”), each associated with a direction, to N audio output signals (fig.2 “L,R,C,S”), each associated with a direction, wherein N is larger than M, comprising

providing a m:n variable matrix (fig.2 #5), where m is a subset of M and n is a subset of N, applying a respective subset of said M audio input signals to each of said variable matrices, deriving a respective subset of said N audio output signals from each of said variable matrices (col.3 ln.48-64), controlling said variable matrix in response to the subset of input signals applied to it (col.3 ln.34-48) so that a sound field generated by the respective subset of output signals derived from it has a compact sound image in the nominal ongoing primary direction of the subset of input signals applied to it when such input signals are highly correlated, the image spreading from compact to broad as the correlation decreases and progressively splitting into multiple compact sound images, each in a direction associated with an input signal applied to it, as the correlation continues to decrease to highly uncorrelated, and deriving said N audio output signals from the subsets of N audio output channels (fig.1, col.2 ln.61-67, col.3 ln.1-28). It is clear from figure 1 of Irwan that the correlation ratio (a/b) is directly affected by the momentaneous amplitude of the input L and R signals. Such signal amplitude fluctuations provide a variability in the location of a sound image, thus the correlation between the “L” and “R” signals is directly related to the direction or localization of the sound image, whether it be compact or broadened.

Irwan does not disclose expressly wherein the input signals M are three or more, or wherein there is a plurality of matrices. Moorer discloses a surround sound system including inputs numbering 3 or more (fig.5 #121,123,125) and a plurality of matrices (fig.5 #129,131). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use 3 or more inputs and multiple matrices in the invention of

Irwan as performed by Moorer. The motivation for doing so would have been to reproduce spatial outputs from a 3 or more input channel system, such as inputs from multiple microphones.

With respect to claim 26, Irwan discloses process according to claim 25 wherein said variable matrices are also controlled in response to information that compensates for the effect of one or more other variable matrices receiving the same input signal (Moorer: col.9 ln.3-17).

With respect to claim 27, Irwan discloses a process according to claim 25 or claim 26 wherein deriving said N audio output signals from the subsets of N audio output channels includes compensating for multiple variable matrices producing the same output signal (Moorer: col.9 ln.3-17).

With respect to claim 29, Irwan discloses a process for translating M audio input signals (fig.2 “L,R”), each associated with a direction, to N audio output signals (fig.2 “L,R,C,S”), each associated with a direction, wherein N is larger than M, comprising providing an M:N variable matrix (fig.2 #5) responsive to scale factors that control matrix coefficients or control the matrix outputs, applying said M audio input signals to said variable matrix (col.3 ln.34-64), providing a m:n variable matrix scale factor generator (fig.2 #2), where m is a subset of M and n is a subset of N, applying a respective subset of said M audio input signals to said variable matrix scale factor generator, deriving a set of variable matrix scale factors for respective subsets of said N audio output signals from said variable matrix scale factor generator (col.3 ln.44-55), controlling said variable matrix scale factor generator in response to the subset of input signals applied to it so

that when the scale factors generated by it are applied to said M:N variable matrix, a sound field generated by the respective subset of output signals produced has a compact sound image in the nominal ongoing primary direction of the subset of input signals that produced the applied scale factors when such input signals are highly correlated, the image spreading from compact to broad as the correlation decreases and progressively splitting into multiple compact sound images, each in a direction associated with an input signal that produced the applied scale factors, as the correlation continues to decrease to highly uncorrelated, and deriving said N audio output signals from said variable matrix (fig.1, col.2 ln.61-67, col.3 ln.1-28). It is clear from figure 1 of Irwan that the correlation ratio (a/b) is directly affected by the momentaneous amplitude of the input L and R signals. Such signal amplitude fluctuations provide a variability in the location of a sound image, thus the correlation between the “L” and “R” signals is directly related to the direction or localization of the sound image, whether it be compact or broadened.

Irwan does not disclose expressly wherein the input signals M is three or more, or wherein there are a plurality of matrix scale factor generators. Moorer discloses a surround sound system including inputs numbering 3 or more (fig.5 #121,123,125) and a plurality of matrices (fig.5 #129,131). At the time of the invention it would have been obvious to a person of ordinary skill in the art to use 3 or more inputs and multiple matrix scale factor generators in the invention of Irwan as performed by Moorer. The motivation for doing so would have been to reproduce spatial outputs from a 3 or more input channel system, such as inputs from multiple microphones.

With respect to claim 30, Irwan discloses a process according to claim 29 wherein said variable matrix scale factor generators are also controlled in response to information that compensates for the effect of one or more other variable matrix scale factor generators receiving the same input signal (Moorer: col.9 ln.3-17).

With respect to claim 31, Irwan discloses a process according to claim 29 or claim 30 wherein deriving said N audio output signals from said variable matrix includes compensating for multiple variable matrix scale factor generators producing scale factors for the same output signal (Moorer: col.9 ln.3-17).

Allowable Subject Matter

Claims 4-5, 24 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Griesinger (US 5,796,844) discloses a multichannel active matrix sound reproduction with maximum lateral separation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON R. KURR whose telephone number is (571)272-0552. The examiner can normally be reached on M-F 10:00am to 6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on (571) 273-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jason R Kurr/
Examiner, Art Unit 2615

/Vivian Chin/
Supervisory Patent Examiner, Art Unit 2615